Claims

1. A composition comprising an antigen bearing target and further comprising a fusion polypeptide, said fusion polypeptide comprising

a first amino acid sequence which is selected from: a carbohydrate binding domain of a collectin; a carbohydrate binding domain of a galectin; a carbohydrate binding domain of a C-type lectin; or an amino acid sequence which can bind to a carbohydrate on a glycoprotein, said carbohydrate being chosen from the group: D-mannose, D-glucose, D-fucose, L-fucose, N-acetyl-beta-D-glucosamine, N-acetyl-beta-D-glucosamine, a sialic acid;

and

a second amino acid sequence comprising a ligand for a cell surface polypeptide, said ligand being chosen from the group: a ligand for a cytokine receptor, a ligand for CD40, a ligand for an adhesion molecule, a ligand for a defensin receptor, a ligand for a heat shock protein receptor, a ligand for a T cell costimulatory molecule, a ligand for a counterreceptor for a T cell costimulatory molecule.

2. The composition of claim 1, wherein said antigen bearing target is a cell.

3. The composition of claim 2, wherein said cell is a tumor cell.

4. The composition of claim 3, wherein said tumor cell is a malignant tumor cell.

5. The composition of claim 3, wherein said tumor is derived from one of the following types of tumors: Melanoma, squamous cell tumor, basal cell carcinoma, astrocytoma, glioma, glioblastoma multiforme, meningioma, ependymom, schwannoma, neuroblastoma, retinoblastoma, meningioma, glomus tumor, sarcoma, osteosarcoma, Ewing's sarcoma, chondrosarcoma, myosarcoma, synovial cell sarcoma, fibrosarcoma, spindle cell tumor, angiosarcoma, primitive

neuroectodermal cell tumor, Kaposi's sarcoma, lymphoma, acute leukemia, chronic leukemia, tumors of the head and neck, nasopharyngeal carcinoma, carcinoma of the pharynx, laryngeal carcinoma, carcinoma of the thyroid, carcinoma of the parathyroids, thymoma, esophageal carcinoma, gastric carcinoma, tumors of the small bowel, carcinoma of the colon or rectum, mesothelioma, lung carcinomas, pancreatic carcinoma, islet cell tumors, non-islet cell tumors, carcinoma of the breast, cardiac myxoma, pituitary tumors, carcinoid tumors, hepatoma, cholangiocarcinoma, hepatoblastoma, renal cell carcinoma, nephroblastoma, Wilms' tumor, adrenal carcinoma, pheochromocytoma, germ cell tumors, choriocarcinoma, ovarian carcinoma, testicular tumors, seminoma, endometrial tumors, carcinoma of the prostate, carcinoma of the seminal vesicles, vaginal tumors, carcinoma of the penis, hydatiform moles, carcinoma of the gall bladder, and carcinoma of the urinary bladder.

6. The composition of claim 2, wherein said fusion polypeptide is exogenous to said cell.

7. The composition of claim 2, wherein said fusion polypeptide is endogenous to said cell and is encoded by a nucleic acid sequence comprised by the cell.

8. The composition of claim 1, wherein said first amino acid sequence is N-terminal to said second amino acid sequence.

9. The composition of claim 1, wherein said first amino acid sequence is C-terminal to said second amino acid sequence.

10. The composition of claim 1, wherein said first amino acid sequence can bind to a sialic acid on a glycoprotein, said sialic acid comprising at least one of the following

carbohydrate structures: N-acetylneuraminic acid, alpha-NeuNAc-[2->6]-Gal, alpha-NeuNAc-[2->6]-GalNAc, alpha-NeuNAc-[2->3]-Gal.

11. The composition of claim 1, wherein said first amino acid sequence comprises a carbohydrate-binding domain of a naturally occuring lectin.

12. The composition of claim 1, wherein said first amino acid sequence comprises at least about 10 contiguous amino acids of a hemagglutinin.

13. The composition of claim 12, wherein said hemagglutinin is an influenza virus hemagglutinin.

14. The composition of claim 13, wherein said contiguous amino acids of an influenza hemagglutinin are contiguous amino acids of an influenza hemagglutinin HA1 domain.

15. The composition of claim 13, wherein said influenza virus is an influenza A virus.

16. The composition of claim 15, wherein said influenza virus is of a subtype that infects humans.

17. The composition of claim 15, wherein said influenza virus is of an H1 subtype.

18. The composition of claim 17, wherein said influenza virus is from the strain A/PR/8/34.

19. The composition of claim 18, wherein said influenza virus is of an H2 or H3 subtype.

20. The composition of claim 13, wherein said influenza virus is of a subtype that does not infect humans.

21. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a mammalian cell surface polypeptide.

22. The composition of claim 21, wherein said ligand for a cell surface polypeptide is a ligand for a mouse cell surface polypeptide.

23. The composition of claim 21, wherein said ligand for a cell surface polypeptide is a ligand for a human cell surface polypeptide.

24. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a cell surface polypeptide of a leukocyte.

25. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a cell surface polypeptide of an antigen presenting cell.

26. The composition of claim 25, wherein said ligand for a cell surface polypeptide is a ligand for a cell surface polypeptide of a professional antigen presenting cell.

27. The composition of claim 24, wherein said ligand for a cell surface polypeptide is a ligand for a cell surface polypeptide of a dendritic cell.

28. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a mouse GM-CSF receptor.

29. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a mouse GM-CSF.

30. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a mouse GM-CSF.

31. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a human GM-CSF receptor.

32. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a human GM-CSF.

33. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a human GM-CSF.

34. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for an interleukin.

35. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a mouse interleukin.

36. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a human interleukin.

37. The composition of claim 34, wherein said interleukin is chosen from the group: IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25.

38. The composition of claim 34, wherein said ligand for a cell surface polypeptide comprises at least about 5 contiguous amino acids of an interleukin.

39. The composition of claim 38, wherein said interleukin is chosen from the group: IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25.

40. The composition of claim 34, wherein said ligand for a cell surface polypeptide comprises an interleukin.

41. The composition of claim 40, wherein said interleukin is chosen from the group: IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25.

42. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a chemokine.

43. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a mouse chemokine.

44. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a human chemokine.

45. The composition of claim 42, wherein said chemokine is a C-C cytokine.

46. The composition of claim 42, wherein said chemokine is a C-X-C cytokine.

47. The composition of claim 42, wherein said cell surface polypeptide is chosen from the group: CXCR-1, CXCR-2, CXCR-3, CXCR-4, CCR-1, CCR-2, CCR-3, CCR-4, CCR-5, CCR-6, CCR-7, CCR-8.

48. The composition of any of claim 42, wherein said chemokine is chosen from the group: 9E3, AMCF, beta-thromboglobulin, ENA-78, eotaxin, eotaxin-2, IP-10, KC, LIX, mig, MGSA, mob-1, NAP-2, NAP-3, NAP-4, PBSF, MGSA, mouse KC, MIP-2, MIP-1 alpha, NAP-2, ENA-78, GCP-2, ACT-2, C10, CCF18, DC-CK1, ELC, Exodus, FIC, GDCF, GDCF-2, HC-21, HCC-1, I-309, JE, LAG-1, MARC, MCAF, MCP-1, MCP-2, MCP-3, MCP-4, MCP-5, MRP-2, RANTES SDF, TARC, ATAC, Ltn, SCM-1, neurotactin.

49. The composition of any of claim 42, wherein said ligand for a cell surface polypeptide comprises at least about 5 contiguous amino acids of a chemokine.

50. The composition of claim 49, wherein said chemokine is chosen from the group: 9E3, AMCF, beta-thromboglobulin, ENA-78, eotaxin, eotaxin-2, IP-10, KC, LIX, mig, MGSA, mob-1, NAP-2, NAP-3, NAP-4, PBSF, MGSA, mouse KC, MIP-2, MIP-1 alpha, NAP-2, ENA-78, GCP-2, ACT-2, C10, CCF18, DC-CK1, ELC, Exodus, FIC, GDCF, GDCF-2, HC-21, HCC-1, I-309, JE, LAG-1, MARC, MCAF, MCP-1, MCP-2, MCP-3, MCP-4, MCP-5, MRP-2, RANTES SDF, TARC, ATAC, Ltn, SCM-1, neurotactin.

51. The composition of claim 42, wherein said ligand for a cell surface polypeptide comprises a chemokine.

52. The composition of claim 51, wherein said chemokine is chosen from the group: 9E3, AMCF, beta-thromboglobulin, ENA-78, eotaxin, eotaxin-2, IP-10, KC, LIX, mig, MGSA, mob-1, NAP-2, NAP-3, NAP-4, PBSF, MGSA, mouse KC, MIP-2, MIP-1 alpha, NAP-2, ENA-78, GCP-2, ACT-2, C10, CCF18, DC-CK1, ELC, Exodus, FIC, GDCF, GDCF-2, HC-21, HCC-1, I-309, JE, LAG-1, MARC, MCAF, MCP-1, MCP-2, MCP-3, MCP-4, MCP-5, MRP-2, RANTES SDF, TARC, ATAC, Ltn, SCM-1, neurotactin.

53. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for an interferon.

54. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a mouse interferon.

55. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a receptor for a human interferon.

56. The composition of claim 53, wherein said interferon is chosen from the group: an interferon-alpha, an interferon-beta, an interferon gamma.

57. The composition of claim 53, wherein said ligand for a cell surface polypeptide comprises at least about 5 contiguous amino acids of an interferon.

58. The composition of claim 57, wherein said interferon is chosen from the group: an interferon-alpha, an interferon-beta, an interferon gamma.

59. The composition of claim 53, wherein said ligand for a cell surface polypeptide comprises an interferon.

60. The composition of claim 59, wherein said interferon is chosen from the group: an interferon-alpha, an interferon-beta, an interferon gamma.

61. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a mouse TNF-alpha receptor.

62. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a mouse TNF-alpha.

63. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a mouse TNF-alpha.

64. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a human TNF-alpha receptor.

65. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a human TNF-alpha.

66. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a human TNF-alpha.

67. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a mouse flt-3 receptor.

68. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a mouse flt-3.

69. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a mouse flt-3.

70. The composition of claim 1, wherein said ligand for a cell surface polypeptide is a ligand for a human flt-3 receptor.

71. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises at least about five contiguous amino acids of a human flt-3.

72. The composition of claim 1, wherein said ligand for a cell surface polypeptide comprises a human flt-3.

73. The composition of claim 1, wherein said fusion polypeptide further comprises a linker interposed between said first and second amino acid sequences.

74. The composition of claim 73, wherein said linker has the formula $(Gly_xSer)_n$, wherein n is an integer between 1 and 15, and x is an integer between 1 and 10.

75. The composition of claim 1, which comprises said fusion polypeptide bound to a carbohydrate on said antigen bearing target.

76. The composition of claim 1, in which at least some of said fusion polypeptide is not bound to said antigen bearing target.

77. The composition of claim 1, wherein said antigen bearing target is a cell and said composition comprises said fusion polypeptide bound to a carbohydrate on the surface of said cell.